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1. feeding
2. mammals
3. chromosomes
4. animals (FW)
5. twins
6. human reproduction
7. womb (8) fertilized eggs

LIFE AND GROWTH

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LIFE AND GROWTH

A supplementary reader
on Sex Education
suitable for use in the top class
of a Primary School
and the lower forms in a
Secondary School
by

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and
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with illustrations by
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To
BARBARA JANET REEVE

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PREFACE FOR TEACHERS AND PARENTS

For some time the authors have felt the need of a simple book suitable for the top class in a Primary School and the lower forms in a Secondary School to explain the process of reproduction in nature, but which at the same time stresses the process of reproduction amongst human beings. There are many suitable text-books which deal with the handing on of life in plants and animals, and it is not intended that this should take the place of such books; rather is it to be regarded as supplementary to these.

There is a growing agreement among teachers, parents and others interested in education that there is the need for what is becoming known as 'Sex Education', but from many conversations held with parents and teachers, we find that there is not yet agreement as to who should undertake the work. Many teachers argue that parents are shirking their responsibilities in this matter. Parents, on the other hand, say they are not sufficiently equipped to give the necessary instruction. To us, who have interested ourselves in this work for several years, the fact stands out that both parents and teachers have their responsibilities, and the giving of

sex instruction will have to be regarded as a joint responsibility.

This statement is corroborated by evidence submitted to the "Royal Commission on Population", the Report of which was presented to Parliament in June, 1949: "Our evidence lays a good deal of stress on the harm that is done in family life by ignorance of, or an irresponsible attitude to, sex. Sex education in schools is provided for, and the methods of teaching at different ages are set out in the Ministry of Education pamphlet on the subject. At present it is taught only in a small proportion of our schools. Ideally, no doubt, much of sex education should be given by parents, but many parents find it difficult, partly because they suffer themselves from inadequate or faulty education on the subject. In present circumstances, the schools must play a major part, and the need for a more responsible attitude to sex, based on healthily acquired knowledge, seems to us to justify a much wider development of sex education in schools."

Where the schools can help is in the giving of factual instruction on human reproduction as part of the already existing courses in nature study and biology. The further point arises: what is the most suitable age for the giving of such instruction? If the parents have done their part properly by answering children's questions as and when they arise, by the time a child reaches the end of his Primary School days, he will at least have come to regard human reproduction as a normal and natural thing. Where the Primary Schools can help at this stage is in the systematizing of the child's knowledge. It is important that suitable information should

be given at this age before the child gets emotionally interested in sex. To wait for adolescent years is too late, as this age brings with it its own problems.

It is of interest to note that the Anglican bishops at the 1930 Lambeth Conference stated: 'It is important that before the child's emotional reaction to sex is awakened, definite information should be given in an atmosphere of simplicity and beauty.' This was referred to again by the bishops at the 1948 Lambeth Conference. Speaking of the need for preparation for marriage, the bishops thought that the giving of sex instruction should be separated from preparation for marriage, and that such instruction 'should be given at an earlier age'.

The report, the *Health of the School Child, 1939-45*, also stated: 'Most of the teachers who have had experience in teaching the facts of sex to school children agree that the instruction should be objective and should be given before the child reaches puberty so as to avoid the emotional associations that develop at this period.'

There is then this growing agreement that simple instruction should be given before puberty and our own experience leads us to think that the last year at a Primary School and the first year at a Secondary School are suitable times for the systematizing of the child's knowledge.

The moral problems which are associated with sex during adolescent years need not be anticipated at this stage, though they ought to be dealt with later in the secondary school years. This does not mean that occasionally questions on conduct will not be asked by children before the age of puberty, particularly in

urban areas, and if moral issues are raised, they will have to be dealt with.

The best moral approach at this stage is that the emotional attitude of teachers and parents should be right. If the process of human reproduction is associated in their own minds with feelings of shame and disgust, they can hardly avoid passing on these feelings to children.

The contents of this book are actual lessons which have been given to children in the top class of a Primary School and the lower forms of a Secondary School. It is suggested that such information as this book provides will be of interest to parents, and that it can also be fitted into the school course of biology or nature study. The book can be used as a supplementary reader to the biology book or nature study book already used. By so doing, a broad, general course in biology or nature study, which does not avoid human reproduction, can be assured.

The pattern of the lessons in this book was worked out carefully. The authors asked themselves the question: 'Shall we deal with reproduction in nature in its various forms, gradually leading up to human reproduction?' This plan was found open to serious objections. First, some children through absence would miss the lessons on human reproduction if they were left until the end of the course. Secondly, a school course is seldom completed, and there was the danger that the lessons devoted to human reproduction might be omitted through lack of time to complete the course. It was decided therefore to keep the theme of human

reproduction running through the whole of the course of lessons.

When a child begins to specialize in the Secondary School, he may not have any further contact with biology or nature study in the school. This suggests, therefore, that such information as this book provides should be given to children before they begin to specialize; this underlines the importance of the giving of sex instruction before the age of puberty.

Towards the end of this book we have tried to show in a simple way that human beings, though they have much in common with animals, will never be understood at the animal level; much harm has been done this last few years in the giving of sex instruction by trying to separate the spiritual, moral and mental aspects of sex from the biological aspect. To assume, as some have done, that if the biology of human reproduction is taught, the morals will look after themselves, is quite contrary to the facts. Teachers and parents must always keep this in mind.

Chapter One

THINGS WHICH LIVE

If you look up into the sky when you are out walking, you can sometimes see an aeroplane flying overhead. More often, you can see birds flying. If, however, you saw a bird and an aeroplane side by side on the ground, and you walked towards them, what would happen? The bird would take fright and fly away, but the aeroplane would not move. This is because the bird is alive, but the aeroplane is not. When you go near to the bird, it knows that someone is approaching, but the aeroplane knows nothing at all. Before the aeroplane could begin to move, its tank would have to be filled with petrol, its engine would have to be set running, and the pilot would have to guide it into the air. But the bird needs neither petrol, nor engine, nor pilot. The bird has something the aeroplane has not got; it has life.

So it is with a man and a motor car. The man can walk where he wants to walk, but the motor car can only go where the driver makes it go. Again, this is because the man has life and can think. The motor car is not living and cannot think. Unless there is something wrong with the car, it has to go where the driver wants

it to go, and it must stop when the driver wants it to stop.

There are lots of things in the world that have not life; the stone you see in the road will not have grown bigger in a month's time, as will a tree or a flower. It will not move if it sees you coming nearer. It cannot hear you or see you, for it has not life. Even the stars are not living. A clever man could calculate how far he was from a star, but the star could not calculate how far it was from the man. So although a star may be very big, a man has something a star has not got; he has life and a brain with which he can think.

The chair on which you sit has four legs, but it cannot walk about as can the cow which also has four legs. If you put a cow in a field, it will wander about, but if you put a chair in a field it will stay where you put it, unless someone moves it. The cow has life, but the chair has not. And although a cow cannot think like a man, it can do lots of things which the lifeless chair cannot do. It can eat and breathe and walk about and go to sleep.

As you walk about the world, you should have no difficulty in telling which things have life and which have not. The world is full of living things and things which have not life, and it is interesting as you go for a walk to look around you and to say which things have life and which have not.

What is it which makes a thing a living thing? No one knows the answer to that question. For hundreds of years, scientists have been trying to find an answer, but only God who made the world and everything in it knows what life is.

But even if we do not know what life is, we can try to find out as much as we can about living things, about flowers and trees, about fishes and birds, about mammals and human beings. And one of the things we can find out about living things is how life is passed on. We may not know what life is, but we do know how other living things are made.

We know what has to be done before a new flower can grow, and before fishes and birds and mammals can be born. And best of all, we know quite a lot about how new human beings are made. And that, we think, is the most exciting thing in the whole of the world, and one of the most wonderful things that can happen.

Most boys and girls have asked the question at some time or other: 'Where did I come from?' or 'Who made me?' In this book we shall try to answer these questions, and we shall try to understand how life is passed on; how a new flower comes into being; how new fishes and birds and mammals are made, and most important of all, how new baby boys and baby girls are made. And although we can't answer the question 'What is life?' we can explain how life is passed on. If you understand this when you are boys and girls, it will help you later in life when you will be able in your turn to pass life on, just as your parents passed it on to you.

Chapter Two

THE SMALL BEGINNING

The first thing we need to understand is that nearly everything which grows comes from a seed, or, as we call it in the case of mammals, an egg. That is, life is passed on from a seed or an egg. Some of these seeds or eggs are very, very small. So small are they sometimes, that they can only just be seen by the naked eye. Look at any of the full stops on this page. All human beings, and that includes you, grew from an egg which was smaller than that full stop. You who are now much bigger than this book, were once smaller than any of the full stops on the pages of this book. That may sound very strange to you, but it is true.

So everything else which has life grew from an egg or seed, though some of these were not so small as the one from which the human baby grows. Some of the eggs are fairly large, as, for example, the egg from which a chick is born. You will know how big hen's eggs are, because you will have had lots of them to eat. We shall see later why some eggs have to be bigger than others.

Flowers grow from small seeds. You will probably have seen some seeds when they were being planted in

the garden; you can buy these in packets from the seedsman. They are not all of the same size, but they are all small. So the wild flowers which you see growing by the wayside or in the woods and fields have all grown from small seeds. Even the mighty oak grew from the tiny acorn, a seed about half an inch long.

The butterfly which looks very pretty flying about in the sunlight also grew from a small egg. The eggs of the Cabbage White Butterfly can sometimes be seen on the underside of cabbage leaves. They are shaped like tiny yellow skittles. After about ten days' time a tiny yellow caterpillar comes out of each egg. It first of all eats the egg shell and then feeds on the cabbage leaves. Several weeks later the caterpillar changes into a butterfly. So you see that after passing through different stages of life, a tiny egg can change into a butterfly.

Fishes too grow from small eggs. The fine big salmon all grew from tiny eggs. These adventurous fishes, born in a river, leave their homes for the sea where they remain for several years. Then they return to the same river where they were born and again tiny eggs are laid which later grow into salmon.

The frog, which can live either on land or in water, was also once a tiny egg. The eggs are always found under water, for they would dry up and perish if they were on land. The eggs are protected by coats of jelly which swell up as they enter the water. The mass of eggs, laid close together, is called 'frog spawn'.

Birds, too, as we all know, come from eggs. These are all fairly big, because most of the egg is stored with yolk, the food on which the chick feeds before it leaves

the shell. It is this food that human beings eat when they have an egg for breakfast.

But the eggs from which a kitten or a puppy grows, or from which a human baby grows are, as we have seen, much smaller than the eggs of the bird. There is a reason for this; it is not necessary for these eggs to store large quantities of food to feed the new kitten or puppy or human baby. We shall have more to say about this a little later.

So you see, nearly everything which grows, grows from a small egg or seed. In a way, it is true to say that trees and many flowers come from eggs, and birds and animals come from seeds. An acorn from which the oak tree grows is as much an egg as that from which a bird is hatched. And, in the same way, an egg from which a frog or a bird or a human baby grows is a seed. We can call seeds the eggs of plants, and eggs the seeds of animals. There is much truth in the old saying that all living things come from eggs.

Now most boys and girls know that frogs and birds, fishes and butterflies, come from eggs. But what they have not always understood is that they too come from eggs. There was a time when all boys and girls were tiny eggs, so small that these eggs are difficult to see with the naked eye; smaller, as we said at the beginning of this chapter, than a full stop on this page.

Chapter Three

WHERE ARE THE EGGS LAID?

Eggs are laid and begin to grow in a variety of places. If you buy a packet of seeds from the seedsman, you don't expect them to change into lovely flowers if you leave them in the packet. You go out into the garden, prepare the soil and plant the seeds just below the surface of the soil. The soil keeps the seeds warm and moist; later they begin to grow and then the first shoots appear above the soil. The earth takes care of the seeds as a mother takes care of her baby; sometimes we speak of the earth as Mother Earth. We can think of the earth as a nest in which the new plants begin to grow.

The eggs which will sometime turn into caterpillars and later into butterflies are often laid on leaves. The Cabbage White Butterfly, which is one of the commonest of butterflies, lays its eggs on the underside of the cabbage leaf. Here the eggs remain until they hatch out into caterpillars.

Fishes and frogs lay their eggs in water. The eggs of the salmon are buried in the gravel bed of the river. Some fishes even make nests for their eggs. The male stickleback shapes a nest on the bed of the stream like a

barrel resting on its side, but open at one end. This is made from scraps of water weed, stuck together with a kind of glue which comes from his body. In this nest, which the stickleback guards, the baby sticklebacks are hatched.

The eggs of the frog are laid under the water and there the frog spawn remains until the eggs are hatched. Frogs do not makes nests for the eggs as do some fishes, and the frog spawn can be easily seen under the water.

The nests of birds we are all used to seeing. They are to be found in trees, in the grass and sometimes under the eaves of houses. They are made from bits of dried grass, pieces of wool or anything handy that the bird can find. Different kinds of birds use different materials, so that when a nest is empty we can, by noticing how it is made, tell the kind of bird it belongs to. They are beautifully shaped and are quite smooth inside. The eggs are laid in the nest, and on them the mother bird or hen sits, until they are hatched. In some kinds of birds, the father or cock takes a share in sitting on the eggs. It is often quite easy to find birds' nests with the eggs inside, but the eggs should not be touched.

So far we have thought about eggs which are laid under the ground, under the water and above the ground. But we have not yet thought of the place where the eggs of a cat or a dog or a rabbit are laid. These are examples of warm-blooded animals which we call mammals, a word which we shall see presently describes how such animals feed their young. The eggs of a bird are easily seen; so too are the eggs of a frog. And if you disturb the soil, plant seeds can easily be seen.

And if it were possible for you to go under the water, you could see the nest and the eggs of the stickleback.

But you would have to look a long time before you found the eggs of a rabbit, or a cat or dog. You would not find them if you looked under the ground, or in the water, or in a nest in a tree. Why is this, do you think? It is because the eggs of these animals remain inside the female cat or dog or rabbit. There is a specially prepared place, which you can think of as a nest if you like, inside the female. This is true of all mammals. The seed from which the calf grew was inside the cow. We

FIG. 1

Calf growing inside cow

have a name for this nest which is to be found inside female mammals; we call it the womb or uterus. The first of these names you will find is the word used in the Bible, but the word uterus is not so well known. Try to remember it, as we shall use it again.

Now let us think about the nest in which the human baby first grows. We have seen (page 19) that all human babies grow from a tiny egg. Where was this egg laid? Again, you would not find a human egg by looking under the soil, or in the water, or in a nest in a tree. The egg from which you grew was laid inside your own mother, and there it remained for several months until you were born into the world. You can think of this place inside a mother as a nest, but the correct name for it is either womb or uterus.

It is in a womb or uterus inside a mother that all human babies first grew. The tiny seed or egg, smaller, don't forget, than a full stop on this page, began to grow and grow inside the mother's womb or uterus. The egg divided into two parts, then four, then eight, then sixteen and so on, all the parts sticking together. At the end of nine months the single egg had grown into the complicated body of a baby, ready to be born into the world. During these nine months the growing baby was in the mother's womb or uterus.

So you see that eggs can be laid in all sorts of places: under the ground, in the water, above the ground, in all of which places the eggs can be seen. But most interesting of all is the fact that the eggs of human beings are laid inside the human mother. For the first nine months of our life, we were inside the womb or uterus of our own mother.

FIG. 2

Baby inside mother

Chapter Four

THE SAFEST PLACE FOR THE YOUNG

We have seen that seeds can be laid in all sorts of places. What is the safest place of all? Let us think about this, for it is important. We said a little earlier that if you wanted plants to grow from the seeds you had bought from the seedsman, you would first of all prepare the soil and then plant the seeds just below the surface of the soil. Sometimes, when a gardener plants seeds like that, he places string over the plot. Fastened to the string you can sometimes see bits of paper fluttering in the breeze. The gardener goes to all this trouble so that the birds will be scared away; they like plant seeds for food. Sometimes in the fields you can see a scarecrow dressed in his shabby old clothes. He too scares the birds away from the newly planted seeds. The seeds in the ground can easily be disturbed with a spade or a fork. The soil is not one of the safest places for the growth of a seed.

And what of the fishes' eggs underneath the water? These too are very easily disturbed. The movement of the water can wash them away. Also, the eggs make

good food for other fishes, and many of them are eaten. Like the soil, the water is not one of the safest places for a seed or an egg which is beginning its new life.

How many of you have been bird nesting? Eggs so easily get broken, and when the egg is broken, it is no use for bringing new life into the world. And even if you don't break an egg you sometimes scare the sitting bird off the nest. Before the new birds are hatched the mother bird or father bird has to sit on the eggs to keep them warm. If they are not kept warm the baby birds will not hatch out. So if the sitting bird is scared away from the nest for too long, the eggs become chilled and are useless. A bird's nest is not a very safe place to hatch out the young.

A much safer place is the nest inside the female, in what we have called the womb or the uterus. The mother cat can walk about with the kittens growing inside her. They are kept warm and free from danger. No one can disturb them as plant seeds are disturbed. No one can eat them as fishes' eggs are eaten. No one can steal them as birds' eggs may be stolen.

So it is with the human baby. The safest nest of all is the human mother's womb or uterus. The human mother can walk about, and go about her daily work, knowing that the growing baby is safe inside her. She can take care of herself, knowing that the more she takes care of herself, the better it will be for the baby. There is no risk of her baby getting chilled as a bird's egg can be chilled; in the mother's womb, the baby keeps snug and warm. For nine months, until the baby is ready to come out into the world, the seed which was

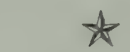
laid inside the mother's womb or uterus grows and grows into a big baby. In fact, it grows until it is about 900,000,000 times bigger than that first egg. And all the time it is growing, it is kept safe and warm.

It is very important that the human baby should begin its life in the safest place of all. You will easily see the reason for this if you compare the number of human babies born at a time with the number of other living things. Even if hundreds of eggs which have been laid by one fish are eaten, there will still be thousands left to hatch out. If the birds eat a large number of the seeds planted in the ground, there will still be many left.

But usually, though not always, as we shall see later, human babies are born one at a time. And the human mother loves her baby far more than does the mother of any other living thing. That is why it is very important that the human baby should begin its life in the safest nest of all, the mother's womb. The human mother knows that normally only one baby can be born to her at a time. She looks forward to her baby coming into the world, and she is glad that God has provided for it the safest, warmest and best nest of all, her own womb.

Chapter Five

FEEDING



Three things are necessary to help seeds to grow. They are the same three things that you need to live: food, water and air. Without food, you could probably live about thirty or forty days. You could live without water for about three days. But without oxygen that the air gives you, you could live only for a few moments. You must have all these things to live, food, air and water.

This is true also with a seed which is planted, whether it is a seed in the ground, an egg under the water, in a nest in a tree, or in the mother's womb. If these seeds or eggs are to begin growing when they have been planted or laid, they must be supplied with food and water and air.

Think first of the seed which has been planted in the ground. For a little while there is enough food in the seed itself to enable it to live. Soon it sends out roots into the ground. Through these roots it is supplied with food and water. Then the shoots begin to appear above the ground, and through the leaves the plant begins to breathe.

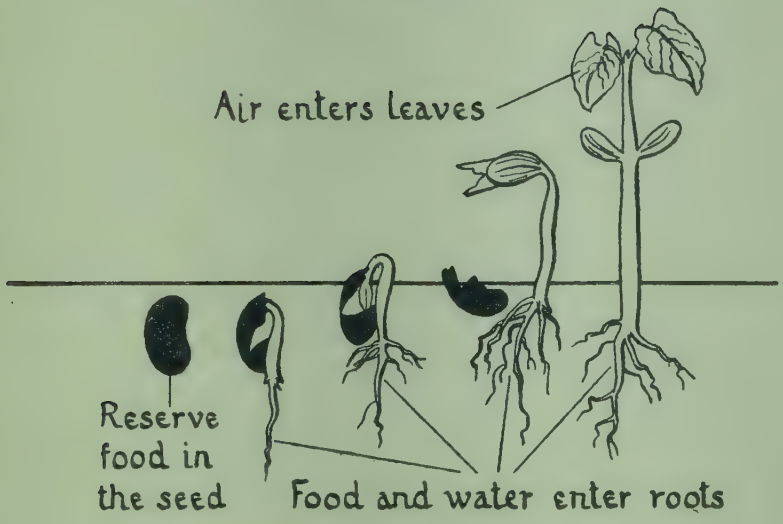


FIG. 3

How a plant seed grows

Before a fish is hatched out from an egg, it feeds on the yolk inside the egg. The salmon eggs, as we have seen, hatch out at the end of winter into tiny fish. And even when they have hatched out into fish, they still carry with them for about a month a yolk-sac with its store of food; this yolk-sac is attached to the baby fish. The air which the fishes need is dissolved in the water, and it is from the water that they take the air.

How does the baby chick feed before it is born, shut up as it is in a hard egg shell? Most of you will no doubt like the yolk of the eggs which you sometimes have for breakfast. So does the unborn chick; it is on the yolk that the unborn chick feeds. The egg shell is also porous; that is, air can pass through it. So the unborn chick can take in air through the egg shell which surrounds it.

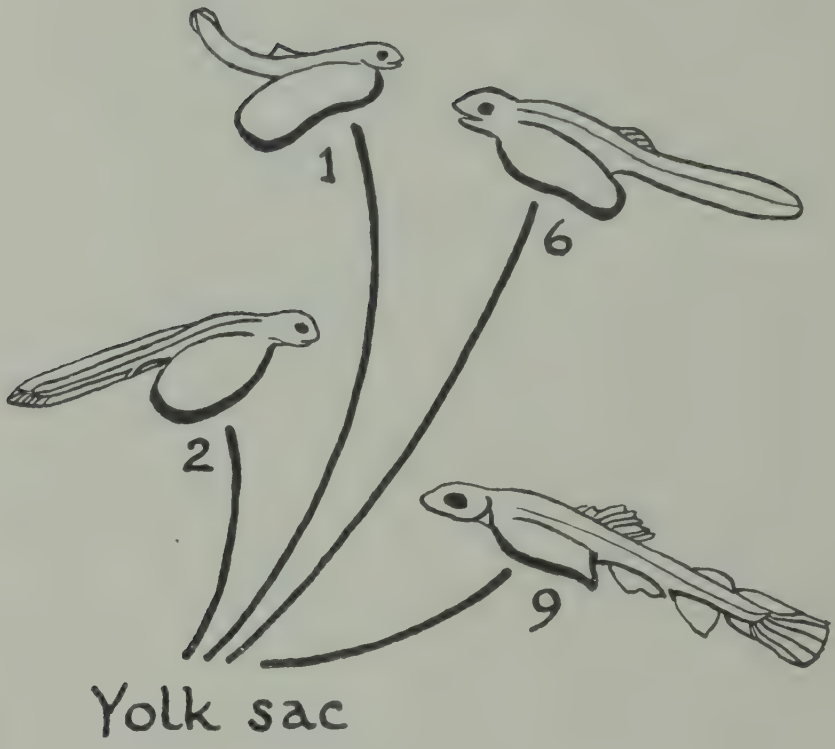


FIG. 4

Baby fishes, one, two, six and nine weeks old

Now what of the baby calf, or the kitten or the human baby? How do all these living things which are yet unborn take in food, water and air? The calf, the kitten and the human baby are all given food, water and air in the same way. If we understand one of these, we shall understand them all, so we will think of the human baby, for this is what we are most interested in.

First of all, let us be quite clear how the unborn baby does not receive its food, water and air. If we who are

born are hungry, we take food through the mouth. If we are thirsty, we drink; again through the mouth. If we want air, and this is always happening, though we don't notice it very much, we should breathe it in through the nostrils. But the unborn baby uses neither the nose nor the mouth. How then does it manage to eat, drink and breathe?

You will have seen that in the middle of your own abdomen, there is a small hollow, hard like a button; this is known as the navel, or more popularly the 'belly-button', or 'tummy-button'. Before you were born and whilst you were in your mother's womb, food and air were passed to you through this navel. Inside the mother's womb, before a baby is born, there is a spongy pad known as the placenta; this is attached to the wall of the womb, and consists mainly of blood-vessels through which can flow the blood of both the mother and the unborn baby, though the blood of the mother and baby do not mix. Joining the placenta and the navel is a tube, known as the umbilical cord. In this cord there are two sets of blood-vessels through which flow the blood of the baby only.

Food and air are carried by the mother's blood-vessels to the placenta, and there they cross over into the baby's blood-vessels in the umbilical cord. From the blood-vessels in the umbilical cord, the food and air are passed to the unborn baby. So you see, not only does the human mother feed and breathe for herself, but she has to feed and breathe for her unborn baby as well. That is why a mother who is carrying an unborn baby in her womb needs good food and plenty

of fresh air, for she has to feed two persons and not one only.

The umbilical cord also serves another purpose. Not only do food and air pass from the mother to the baby, but the waste products from the baby pass in the

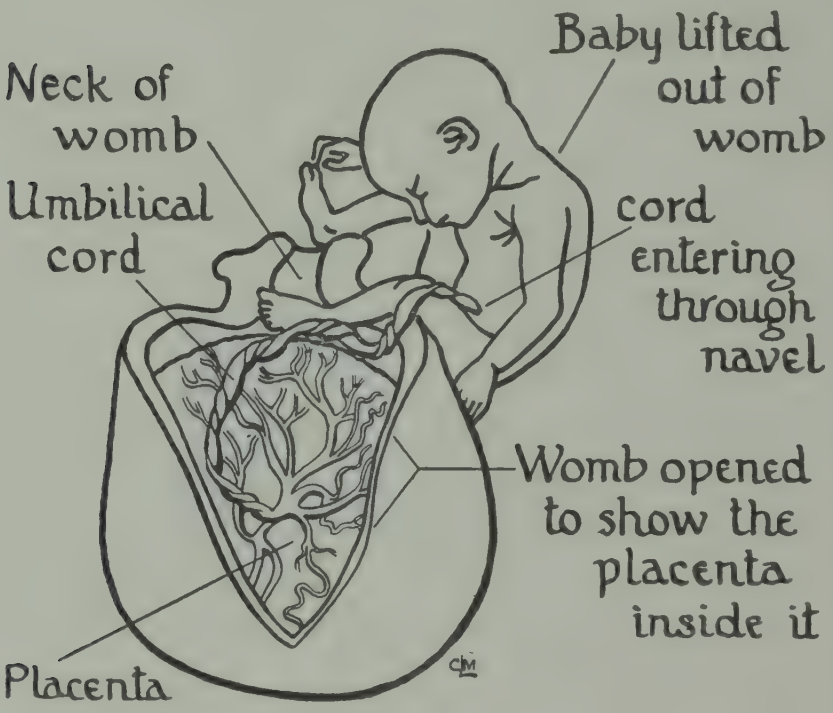


FIG. 5

How the baby is attached to the placenta by the cord

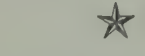
opposite direction and out through the mother in the usual way. Along the umbilical cord there is a two-way traffic: food and air pass in one direction and the waste products in the other. As we shall see later, when the

baby is born, the umbilical cord is cut at the navel. That little spot should remind you of the fact that once you were joined to your mother, before you were born and for a few moments after you were born. But we shall have more to say about this in a later chapter.

There are certainly some wonderful ways of feeding all sorts of things before they are born, but we can think of nothing more wonderful than the way the human mother feeds the human baby before it comes into the world.

Chapter Six

WHAT STARTS A SEED GROWING?



Most of you will no doubt know something about the way a hen hatches out new chickens. Certainly if you have kept hens you will know that a broody hen sits on the eggs to keep them warm until the chicks are hatched out. But that does not mean that any egg will do to hatch out a chick. Even if a hen sits on a newly laid egg, it does not follow that that egg will produce a chick. Most of the eggs which you have had to eat would not have hatched out into chicks. Why is this?

Let us try to explain a little more fully. An egg alone will never grow into anything. An egg is that part of the seed which is produced by the female. Before the egg will grow, it has to be joined by something which is produced by the male; or, as we say, the egg has to be fertilized. As the female produces the egg, so the male produces the sperm, and when an egg is joined by a sperm, it is said to be fertilized. The egg and the sperm joined together form the fertilized egg from which a new living creature can grow.

That is why most of the eggs you eat for breakfast would never hatch out into chicks. They are only half

FIG. 6

The Human Egg and Sperm drawn to same scale

the seed, and have not been fertilized. To be fertilized, these eggs must be joined by the sperms which come from the males, or cocks.

Now this is true throughout almost the whole of nature. The fertile seed is formed by the joining to-

gether of something produced by the female and something produced by the male. The male, that is father, must play his part; his sperm must join the female egg.

Strange as this may seem, this is often true of flowers. We might almost think of some flowers as 'father' flowers and some as 'mother' flowers. A good example of a flower to help you to understand this is the primrose. If you were to examine several primroses, you would

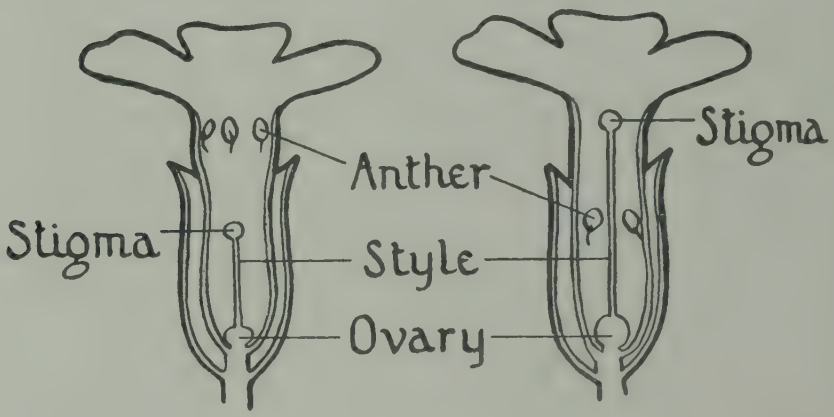


FIG. 7

Two kinds of primroses

find that they have five petals which join together to make a long, narrow tube. There are two kinds of primroses. In one kind, the stigma, which you will know is joined to the ovary where the seeds are, is at the top of the tube. The anthers, which are part of the stamen bearing the pollen, are half-way down. In the other type of primrose the positions are reversed.

In both types, there is a female part and a male part.

The female part is the ovary where the eggs are situated, the male part is the stamen which bears the pollen. Insects with long trunks, such as moths and butterflies, visit the primrose. When they are taking the honey, it doesn't matter much whether the anthers are near the top of the flower or half-way down. The pollen (corresponding to the male sperm) from the stamen of one kind of flower is given to the stigma of the other kind, and as the stigma is joined to the ovary containing the eggs (or seeds as they are usually called in flowers) the seeds are fertilized. Such fertilized seeds will produce new flowers. We can think of the flower from which the pollen comes as the father flower, and the one to which the pollen is taken as the mother flower. The important point to understand is that something from the male must join something from the female before new growth can begin.

This is true also of animals. In fishes, for instance, as we mentioned in an earlier chapter, the salmon, having spent some time in the sea, returns to the river where it was born. The female scoops a hollow in the gravel with her tail, and thus having prepared a place she lays her eggs through an opening in her body. The male fish then swims over the eggs, and from an opening in his body, he sends out lots of sperms. These swim to the eggs, and when an egg is joined by a sperm it is fertilized. From this fertilized egg or seed, a new salmon can develop. The important point to understand is that the joining together of the egg and the sperm takes place outside the bodies of both the male and female fishes; the growth of the fertilized egg also takes place outside,

in the little hollow which the mother fish has scooped out of the gravel with her tail. This activity in fishes, the laying of eggs for fertilization by the males, is called 'spawning'.

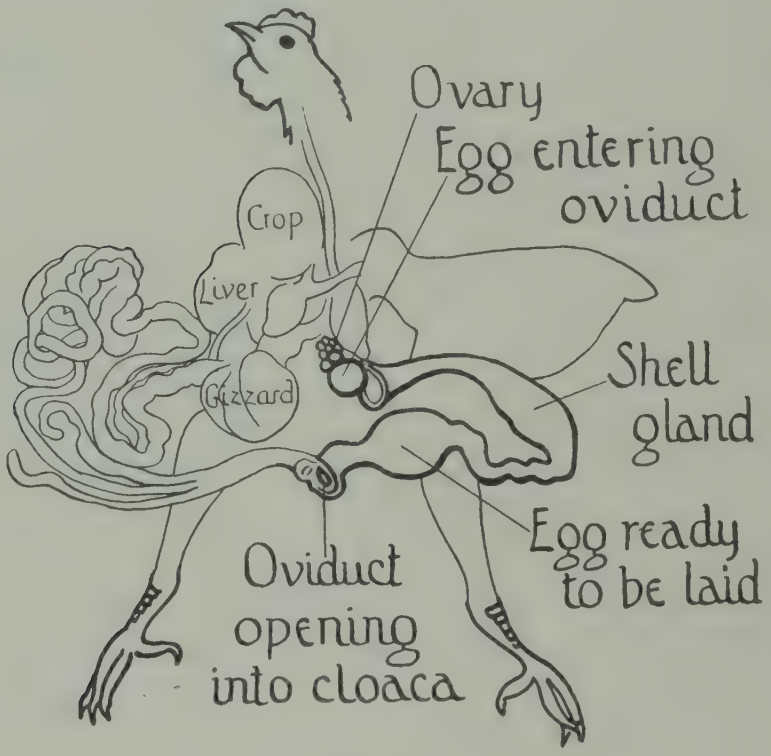


FIG. 8

Where the hen's eggs are made

In birds, though the fertilized egg is hatched outside the body of the female or hen bird, in the nest which has been prepared for the purpose, the joining together of the egg and the sperm takes place inside the body of the female bird.

This happens in the following way. Under the tail feathers of both the hen bird and the cock bird there is an opening known as the cloaca. In the hen bird, the cloaca leads to the ovary where the eggs are made, and in the cock bird it leads to the place where the sperms are made. The cock bird sits on the back of the hen bird, placing his cloaca on the female cloaca. The sperms then pass from the male bird into the body of the female bird, and reach the eggs to fertilize them. A sperm joins an egg before the hard shell is formed. The egg then passes down a tube called the oviduct, and during its journey the shell is made. When the hen pushes the now hard shell out through her oviduct, the egg is laid. If a broody hen sits on an egg which has been fertilized in this way, a chick will be hatched out.

When we compare fishes with birds, we see that there are two slightly different processes. The fertilization and hatching out of fishes' fertilized eggs both take place outside the body of the female fish. But in birds, the joining together of the egg and sperm takes place inside the female; afterwards the fertilized egg is laid and hatched.

In most animals, as we shall see, there is this special act of mating in which the male and female join together as do the male and female birds, for the fertilization of the eggs. You have probably seen something similar when frogs are mating in a pond, the father frog clasping the mother frog firmly while she lays her eggs.

Chapter Seven

MAMMALS

We shall now try to understand how the sperm and the egg join together in mammals. First of all, we had better understand what is meant by a mammal. A mammal is an animal the young of which, after birth, feed on their mother's milk by sucking at the breast, or, as we should say in the case of a cow, the udder. Cows, dogs, cats and human beings are all mammals. The word 'mammal' actually comes from a Latin word meaning 'teat'. Most of us will have seen a baby calf feeding from the udder of the mother cow; so too we shall have seen kittens and puppies sucking the milk from their mothers' teats. Such animals are mammals; they nurse their young.

We have already seen that the young of fishes and birds begin life in the nest which has been prepared for them; this nest is outside the body of the female. But in mammals, not only does the sperm join the egg inside the body of the female, but the fertilized egg remains inside the body and begins to grow there. The place where growth begins is the nest which we mentioned in an earlier chapter, known as the womb or uterus.

If it were possible for you to examine a cow and look inside it, you would find that the uterus is near the hind quarters. The eggs are made in the ovaries, which are near the womb, and can pass from the ovaries into the womb down fine tubes, known as the Fallopian tubes or egg tubes. Leading to the womb from the outside of the body is a passage known as the vagina; this is situated between the hind legs.

The sperms of the male or bull are made in the testes or testicles. Near the testicles are glands which produce a liquid known as the seminal fluid. In this liquid the sperms can swim. The sperms and the seminal fluid can leave the body of the bull through a tube-like organ on the underside of the body; this is known as the penis.

To enable the sperms to join the female eggs, an act of mating takes place. The bull stands upon his hind legs and mounts upon the hind part of the cow. The bull places his penis, which becomes hard and erect, in the vagina of the cow, and whilst they are thus joined together for a few moments, the sperms, swimming in the seminal fluid, pass from the bull through the vagina of the cow and into the womb.

If an egg has been released from an ovary, one sperm from amongst many will join this egg to fertilize it. If the egg has been fertilized, it burrows a little way into the walls of the womb, and then begins to grow until a full-grown calf is ready to be born. The calf is born through the vagina, which enlarges to enable the calf to pass from the cow into the outer world.

It is in this way that all the familiar mammals mate;

cats, dogs, cows, horses, sheep and many others. The penis of the male is placed in the vagina of the female, and the sperms pass from the male into the female to join and fertilize the eggs. The fertilized eggs then begin to grow until the new beings are ready to be born. After that, growth continues in the outside world.

The length of time that it takes to grow from the fertilized egg until the animal is ready to be born varies with the type of animal. This period of time is known as the time of pregnancy or gestation. A cat and a dog spend 63 days in growing from the fertilized egg stage to the birth stage. A lion spends 110 days, a sheep 150 days, a cow 283 days, a horse 346 days and an elephant 600 days.

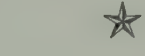
Some animals give birth to more than one at a time. A dog has a litter of from six to eight puppies; a cat four to six kittens, a lion two to four cubs, but usually cows, horses and elephants give birth to one only at a time.

This then is how mammals are born. Now man is a mammal and it is in much the same way that the human baby is born. Most of what has been written in this chapter is well known to all boys and girls who have kept animals, particularly if they happen to live in the country and have seen calves and foals born. But what they do not always understand is that human babies are born in the same way. It is important, indeed it is more important, that we should understand how we were born, for all this knowledge will be helpful when boys and girls grow into men and women and

they too can become fathers and mothers. We shall now explain more fully the difference between boys and girls and between men and women; or, as we sometimes say, between the two sexes, males and females.

Chapter Eight

MALES AND FEMALES



At about the age of fourteen a boy begins to change into a man, and at a little earlier age a girl begins to change into a woman. This we call the age of puberty, and after this age, but not before, it is possible for young men and young women to become parents. This is because the male now begins to produce sperms and the female begins to release eggs from her two ovaries.

It is usually quite easy to tell when boys and girls begin to change into men and women, though we must remember that these changes take place gradually; a boy does not suddenly change into a man nor a girl into a woman. One of the changes that is noticeable in a boy is that his voice gradually changes from a high pitch to a low pitch: we say that his voice is breaking. Another change is that the boy begins to grow hair on various parts of his body, especially on his face, so that he begins to think about shaving.

A girl too changes outwardly; her breasts begin to grow and her hips become larger. A girl's voice too becomes a little fuller, though it does not change from treble to bass as does a boy's voice. Besides these changes

which can be seen or heard, there are inward changes taking place which cannot be seen. To understand these changes, it will help us if we know something of the organs of reproduction of both the male and the female. These are the organs which are needed to bring new life into being.

The womb or uterus of the female is shaped roughly like a pear and is about three inches long. The narrow end of the womb leads to the outside of the body through the vagina, which opens between the legs. This opening is not the same as that through which the urine, sometimes called waste water, passes out of the body. On both sides of the womb are the ovaries where the eggs are made. These eggs are present in the female body at birth, but they begin to ripen at puberty. Every month, beginning at puberty, and continuing for a number of years afterwards (usually until a woman is about fifty years old), an egg is released from one of the ovaries and passes into the womb through one of the Fallopian or egg tubes. If this egg is fertilized by a sperm a new baby will begin to form in the womb. If, however, the egg is not fertilized it will disappear or pass out of the body from the womb through the vagina. Most of the eggs disappear or leave the female in this way, for few of them are fertilized.

Another interesting thing happens in the female body at puberty and continues until the age of forty-five or fifty. Every month, just in case an egg is fertilized and a baby begins to grow, the walls of the womb begin to make ready for this event by increasing the number of blood-vessels which would provide food and oxygen for

the new baby. If the egg is not fertilized, all this monthly preparation will have been in vain, and these new layers of blood-vessels will leave the womb, passing into the outer world through the vagina. This process, which all girls should understand, and all boys know something about, is known as menstruation, or more popularly as the monthly period. It is nature's way of getting rid of the blood and blood-vessels if they are not to be used.

In the male organs of reproduction, the sperms are made in the testes or testicles. These are contained in a little pouch or bag called the scrotum which hangs between the legs. Inside the testicles are very fine coiled tubes, twenty or thirty feet long, and for the sperms to pass out of the male body they have thus a long journey to make. On their way they enter a liquid known as the seminal fluid, which is made mainly in two glands. The sperms, swimming in the fluid, pass out of the male body through the penis, the tube-like organ which hangs between the legs. The penis serves a double purpose, for through it can pass the urine or waste water from the kidneys as well as the sperms. But the urine and the semen (that is, the sperms together with the seminal fluid) cannot both pass through the penis at the same time.

In the male, the making of this semen is always going on. Sometimes the male body has made so much semen that it cannot hold any more and, like a bath which overflows if the taps are left turned on, so the semen overflows, leaving the body through the penis. This is known as a seminal emission, or more popularly as a

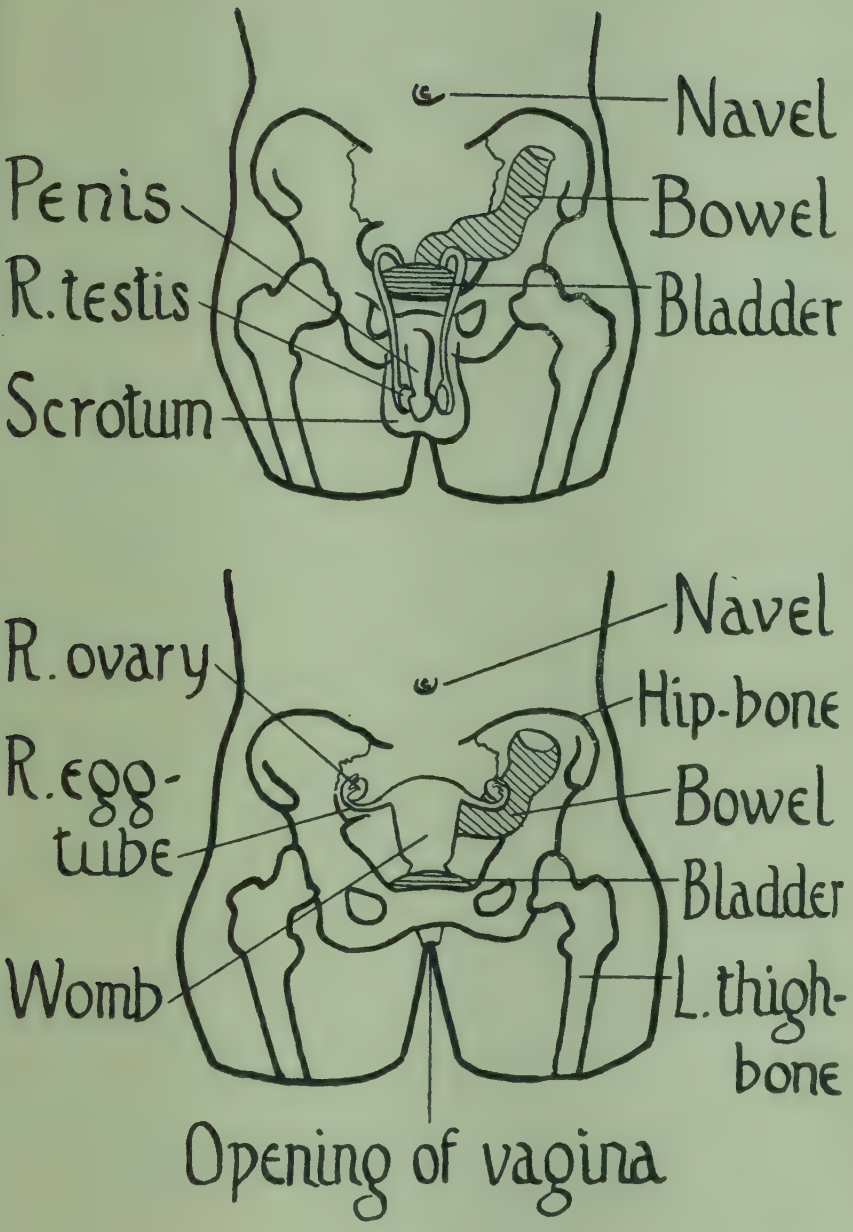


FIG. 9

The reproductive organs of men and women

night loss, as the overflowing usually takes place during sleep at night.

It is most important that boys and girls should understand that both menstruation in the girl and seminal emissions in the boy are natural processes. They are outward signs that girls and boys are changing into women and men. Neither menstruation nor seminal emission is anything to worry about.

As we have already mentioned, before a human baby can be born, the male sperm must join the female egg. This can only take place if there has been an act of mating, or what is properly known as sexual intercourse or coitus. This act, as we shall explain later, should only take place between a man and a woman when they are married and in love. In human beings, before mating or sexual intercourse takes place for the first time, there is a period of courtship. Even when a man and woman are married, they make love to one another in preparation for each act of sexual intercourse. You can see the beginning of this among animals. Some fishes wear bright attractive colours during the breeding season; the stickleback, for example, has a red breast. Amongst birds we often find quite elaborate courtship. Have you ever seen a peacock displaying his wonderful tail feathers in front of the hen? It is a sight not easily forgotten. Even so, it is not as wonderful as the many and varied ways in which human beings try to show their love for each other.

When human beings mate, they usually lie close together, facing each other. The penis becomes hard and erect, and it can then be placed inside the vagina.

The sperms then pass from the testicles and, swimming in the seminal fluid, they leave the male body through the penis, and so enter the vagina of the female. From the vagina they pass into the womb, and travel through it into the egg tubes. If there is an egg ready in one of the egg tubes, then a sperm may reach it and fertilize it. When once an egg has been joined by a sperm, no other sperm can enter that egg.

The male sperm is very tiny, invisible to the naked eye, and is shaped like a tadpole, with a tail which propels it along. The female egg is round in shape and is just visible to the naked eye. When the sperm has joined an egg it drops its tail, for the tail will then have done its work in helping the sperm to reach the egg.

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Chapter Nine

GROWTH IN THE WOMB

Scientists now tell us that a sperm joins an egg near the funnel of the egg tube, that is, at the end of the tube nearest the ovary. If this happens the fertilized egg begins to move down the tube to the womb. It also begins to grow. It grows by division, dividing first into two, then into four, then eight and so on, all the parts sticking together. On reaching the womb it burrows a little way into the wall of the womb, and there continues its development.

During the first few weeks of its life in the womb, the baby is generally called an embryo, and for the last six months or so before birth, it is called a foetus. During the embryo stage it does not look much like a human baby, but in the foetus stage it begins to take on human shape.

Gradually the bones, muscles, nerves, lungs and heart get ready for the time when the baby will leave its mother's womb, and pass into the outer world. As the foetus grows in size, so the mother's womb becomes larger to make room for the growing baby. You can usually tell when a mother is carrying a baby in her

womb, because the shape of her figure alters. Of course, after the birth of the baby she goes back to her normal size.

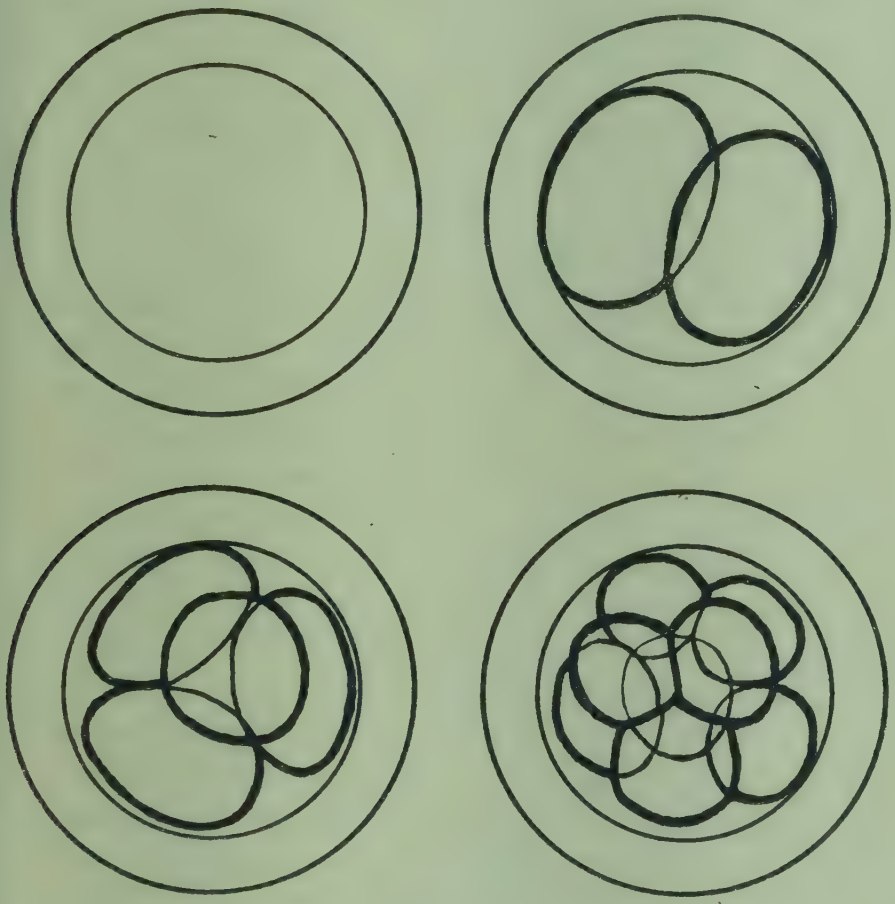

FIG. 10

The Fertilized Egg dividing

During all this time the mother has stopped having her monthly periods, for now the blood-vessels which lined the womb are being used for the purpose for

FIG. 11

The shape of the mother's body alters

which nature made them, the feeding of the unborn baby.

The baby in the mother's womb is very well protected, for it is kept warm and free from jolts due to the movement of the mother, by being enclosed in a sac or bag of fluid. One boy to whom we told this asked a very important question. If the baby is surrounded by fluid, how is it that it does not drown? The answer to that is because the unborn baby does not use its lungs as we do. If you could look at your own lungs, you would find that they were inflated or filled with air. But an unborn baby's lungs are deflated like a balloon which has not been blown up.

As we have previously mentioned (page 33), the air passes to the baby in the blood stream which flows along the umbilical cord; this cord, you will remember, joins the placenta and the navel or belly-button. Food and air pass from the mother, through the placenta and the umbilical cord, to the baby. So too the waste products pass from the baby through the cord and to the mother.

There is no mixing of the mother's blood and the baby's blood. Each has its own separate blood system. The placenta consists of the blood-vessels of the mother and baby, but the umbilical cord contains only the blood-vessels of the baby.

The baby, even before it is born, has its own heart and uses it to pump blood through the blood-vessels. After about eighteen or twenty weeks of growth, the heart-beats of the baby can be heard.

For listening to the heart, the doctor has an instru-

ment known as a stethoscope. You will probably have seen the doctor using this instrument. If he places the stethoscope on the mother's abdomen, not only can he hear the heart-beats of the mother, but he can hear those of the baby also.

Not only can the doctor hear the heart-beats of the baby, but the mother can feel the movements of the baby in her womb. She is glad when she feels these movements, for then she knows that her baby is growing rapidly, and she can look forward to it being born.

So for about nine months, or 280 days, the baby grows in the womb. From the fertilized egg formed by the joining together of a sperm and an egg, there has grown, by the end of this time, a baby weighing several pounds, which is now ready to be born. It has grown to more than 900,000,000 times the size of the egg. So far, it has depended on its mother to supply it with food and oxygen; it is now ready to leave the warmth of the mother's womb and to enter into the outer world, there to become a separate being. We shall now try to understand how this happens, for it is very interesting and exciting.

Chapter Ten

THE BABY IS BORN

After growing for nine months in the mother's womb, the baby is ready to be born. By this time the baby is usually lying upside down in the womb, for it is easiest for him to come out head first. Sometimes, if he is not lying in this way, the doctor turns him round before he is born. Occasionally he does come out feet first, but this is not nearly so common as head first.

The mother knows when the baby is ready to be born, for she begins to feel what are often called labour 'pains', though 'cramp' or 'pins and needles' would really be a better description. When labour starts, she informs the doctor or midwife so that, later on, they can help with the actual birth of the baby.

The reason for the labour 'pains' is that the muscles of the womb are working hard to push the baby out, and also the mouth of the womb and the vagina are having to stretch as wide as possible to let the baby pass. If you have run in races, or perhaps had to lift a very heavy weight, you will know that working your muscles so hard is rather painful. In the same way, the mother feels what may be described as 'pain' because

of the effort she has to make to push the baby out of the womb.

It is very important for girls to understand three things. First, labour is nothing to be afraid of. The midwife, like a gymnastic teacher, will be able to tell the mother how best to use her muscles so as to help the baby on his way as quickly as possible. The mother can practise doing exercises beforehand, and the midwife can also tell her what to do when the baby is actually being born. Secondly, these cramps which, as we have seen, are the result of muscular effort, are not the same thing as pain caused by illness, and they are quickly forgotten when the baby has been born. Thirdly, the midwife can give the mother what is known as 'The Gas and Air Apparatus', a machine which the mother works herself. This enables her to take a whiff of a special gas which does not make her unconscious, but which stops the muscles from working quite so hard and so helps the baby to make the final stage in his journey more slowly and gently.

We have already said that whilst in the womb the baby is floating in a bag of fluid. When the baby moves towards the mouth of the womb, this bag of fluid is pressed smaller, and the pressure on it becomes so great that it bursts, and the fluid pours out of the neck of the womb, and out of the body through the vagina. The breaking of the bag of fluid is what the midwife calls 'the bursting of the bag of waters'. Sometimes she calls it 'the rupture of the membranes', meaning that the delicate transparent skin or 'membranous' bag has broken. This is the first stage in the birth of the baby.

The next stage is the birth of the baby itself. The muscles of the womb work harder and harder. Meanwhile the vagina has been stretching and the baby passes along it and out into the world.

When the baby is born, he is still attached to his mother by the umbilical cord. The midwife or the doctor then ties tightly round the cord two pieces of thread. The threads are placed about an inch apart, and near the navel. The cord is then cut, between the two pieces of thread. The baby is now free from his mother. Sometimes the doctor or the midwife has to help the baby to start breathing. The baby cries loudly, as if to tell the world that a new person has arrived. This cry gives joy to the mother, for then she knows that she has finished her part in the birth, and that her baby is really and truly born.

The midwife cleans the baby's eyes and mouth, and, since he has only just left a very warm place, she wraps him up snugly to keep him warm in the colder world.

After the baby is born there still remains in the womb the placenta, the umbilical cord and the empty bag out of which the baby has been pushed. The placenta peels off from the walls of the womb and, together with the remains of the cord and the bag, is pushed out by the muscles of the womb just as the baby was, and perhaps ten minutes to half an hour afterwards. As these leave the womb after the birth of the baby, they are usually referred to as the afterbirth.

It takes about a fortnight for the womb to shrink to its normal size. During this time, the mother has to rest in bed, for the delivering of her baby to the world has

been very strenuous for her. But the joy that a child has been born to her helps her to forget the pain that she felt whilst her baby was being born. It is best for the mother to remain in bed for this fortnight, during which time she rests and begins to get strong again, though it takes about two months altogether before she has fully regained her strength.

Nature helps in a very interesting way to make the birth of a baby a little easier. If you could see underneath the skin of a newly born baby's head you would find that the skull was not so solid as yours. It is made up of separate pieces of bone with soft parts in between. Whilst the baby's head is passing through the neck of the womb and out through the vagina the separate bones of the skull overlap, sliding over each other, thus making the head a little smaller to allow it to pass through the vagina a little more easily.

After the baby has been born, the head looks slightly misshapen, but it soon returns to its normal shape. After about eighteen months the soft spaces of the baby's skull disappear, and the separate pieces of bone join up to make a complete case for the brain, like the ones we have.

Sometimes it happens that a baby is born before its time; instead of waiting in the mother's womb for the full nine months, it can be born after seven months. It is possible for such a baby, which we say is prematurely born, to live, but great care has to be taken of it, particularly during the first few months of its life.

It is in this way that the human baby, which was once a tiny seed, smaller than a full stop on this page,

is born into the world. It has life, though as we said at the beginning of the book, we do not know what life is. Only God, who gives life, can explain what life is. But what we can say is that the baby is living, and we can now watch it grow through the years, just as you have grown.

FIG. 12

Top of a baby's skull

Chapter Eleven

CHROMOSOMES

You will often have heard people say when they are looking at a baby: 'Isn't he like his father?' or 'Doesn't she look like her mother?' or 'Hasn't he got his mother's eyes?' and all sorts of things like that. These statements are very often true, though, as well as likenesses, children have many characteristics which neither father nor mother possesses.

There is nothing remarkable about a baby looking like father or mother or even like one of its grandparents. It would be more remarkable if the baby hadn't some of the characteristics of one or both of the parents.

This is the reason. We have seen the wonderful way in which a baby comes into the world, as a result of the joining together of a sperm, produced by the father, with an egg, produced by the mother. The egg is so small that it is only just visible to the naked eye, and the sperm is smaller still, and invisible to the naked eye. But, if you were to magnify many times both the sperm and the egg, you would see that they contain what are known as chromosomes. These are very tiny rod-like bodies. It is by means of the chromosomes that character-

istics are handed down from generation to generation. Such characteristics are said to be 'inherited' or 'hereditary', meaning that they are handed down to us by our parents.

In some families, where painted portraits have been kept for many generations, it is often possible to see the same characteristic, as for example the same shape of nose, the look of the eyes, or the colour of the hair, appearing generation after generation. Sometimes these characteristics may not appear in one generation, but later they may appear again. Characteristics such as these will have been handed down by particular chromosomes.

These chromosomes are found not only in the eggs and sperms. They are present also in all the other 'cells' or living units of which the body is made, for example in the bone-cells, muscle-cells, nerve-cells, and so on. Our inheritance is, as it were, stamped on every part of our body.

The pattern of chromosomes handed down to us not only decides whether we shall have fair hair or dark skin, and whether we shall be particularly interested in music or mathematics. It is the chromosome pattern, too, which decides whether the new baby shall be a boy or a girl, for there is a special chromosome concerned with sex.

The decision is made in this way. As far as their sex inheritance is concerned, a woman's eggs are all alike, but a man's body makes two kinds of sperms. Whether the new baby is a boy or a girl depends on which kind of sperm fertilizes the egg.

You may be wondering whether it is possible for parents to know beforehand whether the baby in the mother's womb is going to be a boy or a girl, or even

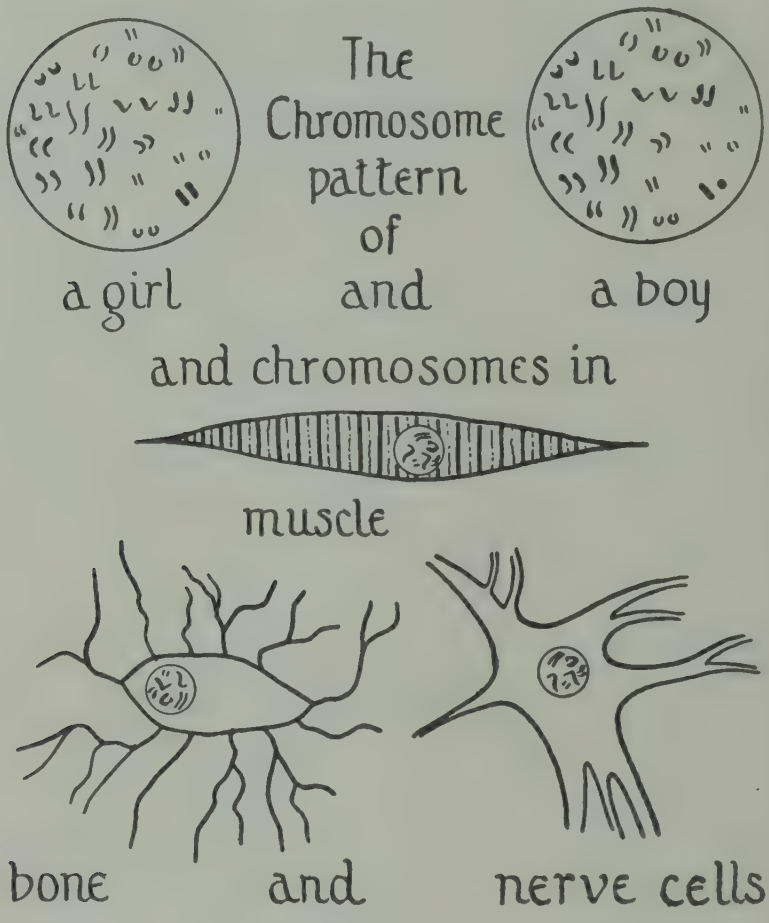

FIG. 13

Our inheritance stamped on every part of our body

whether they can choose which they will have. You may hear people say that if you think hard, you can

decide the sex of your baby; or that if you eat a certain kind of food, you can have a baby boy; or that if the egg comes from one ovary it will be a boy, but if from the other it will be a girl. There is no truth in these statements.

So far scientists cannot tell us how to find out, before

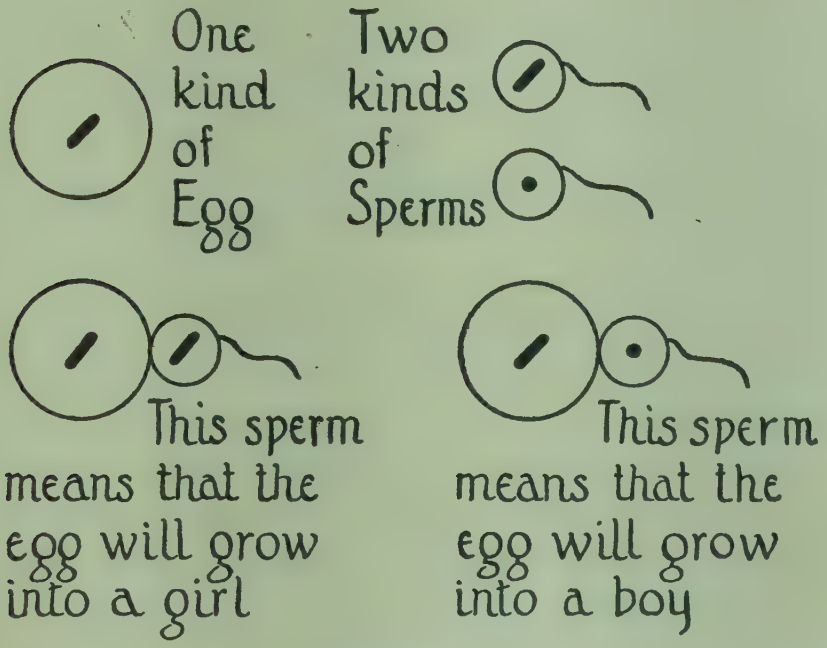
One kind of Egg
Two kinds of Sperms
This sperm means that the egg will grow into a girl
This sperm means that the egg will grow into a boy

FIG. 14

The sperm decides the sex of the baby

birth, whether the baby is a boy or a girl. We have not, so far, been given the opportunity of choosing. As we have seen, the sperm of the father decides the sex of the baby at fertilization, and fertilization takes place in the egg tube, deep inside the mother's body.

Chapter Twelve

TWINS

Up to now we have only talked about the single baby, but what about twins, triplets, quads or quins? Let us explain. There are two sorts of twins: identical twins, which look almost exactly the same, and must be either both boys or both girls; and non-indentical twins, sometimes known as fraternal twins; these may be two boys, two girls, or a boy and a girl.

Now, if you have read Shakespeare's play, *Twelfth Night*, you will remember that he introduces two 'identical' twins, a boy and a girl, named Sebastian and Viola. But identical twins, as we have just seen, must always be of the same sex, either two boys or two girls. Shakespeare didn't know this, because scientific discoveries about the decision of the sex of the baby hadn't been made in his time.

Before we explain the reason for this, let us think about non-identical twins. Earlier in the book (page 47) we said that a woman releases from an ovary one egg only every month. This is not always true, for occasionally she releases two. Now, if both these eggs are fertilized by two different sperms, then twins will be

born, and we call them 'non-identical' or 'two-egg' twins. Each of the two eggs has its own set of chromosomes, carrying different hereditary characters. Each of the sperms also has its own set of chromosomes, carrying different hereditary characters. So the baby which will begin to grow from the joining together of one egg and one sperm will be quite different from the other baby formed by the joining together of the other egg and the other sperm. These two babies may be of the same sex, or they may be of different sexes, depending, as we saw on page 63, on which sort of sperm fertilized them.

But we have all seen twins that are, as we say, 'as

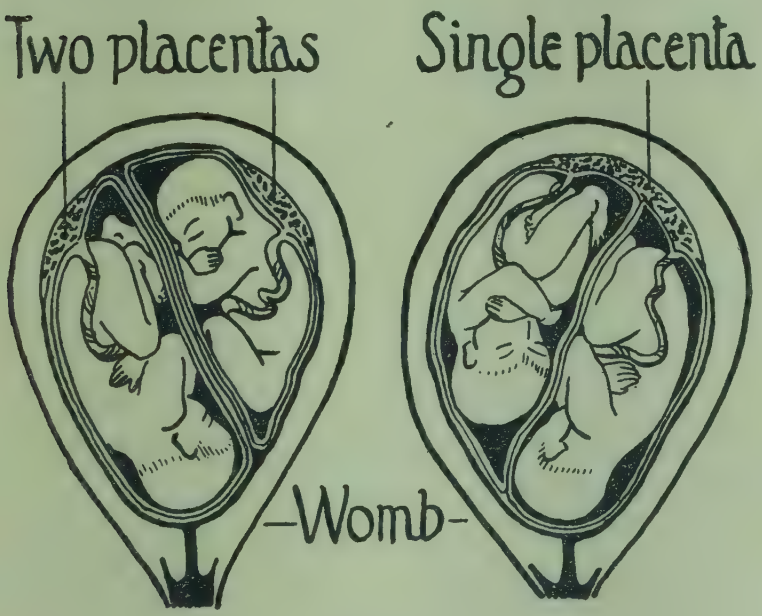

FIG. 15

Fraternal and Identical Twins

like as two peas'. Such twins are identical twins. It is often very difficult to tell one from the other. One of the authors used to know twins who were so much alike that their own mother had great difficulty in telling them apart. She used to make them wear different-coloured ties, and if they wanted to be funny, when they came down to breakfast, they would change ties! Such identical twins are not formed in the same way as non-identical twins. In this case, one egg only is fertilized. This begins to grow in the usual way; then, for some reason which we do not understand, it breaks into two, and from each part there develops a complete baby. Because, as we have seen (page 63), the sex of the baby which is to grow from the egg is decided at the time of fertilization, the twins (or triplets, quads or quins, if the egg divides into more than two parts) must be of the same sex. As well as being of the same sex, identical twins will be much more alike than any other brothers or sisters, because they inherit not only the same sex characteristics, but the same physical and mental ones as well. You do not find, for instance, one identical twin with blue eyes and one with brown.

The life in the womb of the two sorts of twins is also different. Each of the fraternal twins has its own placenta, whilst identical twins share a single one.

Now if you know any twins, and nearly everybody knows one set of twins, you should be able to tell whether they are identical or non-identical. But don't think because both are boys or both girls that they need be identical twins. Think carefully before you decide.

Chapter Thirteen

HUMANS AND ANIMALS

This book has tried to help you to understand how life is handed down amongst human beings; we have also seen that animals reproduce in the same way. This does not mean because the bodies of human beings in some ways resemble those of animals, that there is no difference between humans and animals.

One important difference between humans and animals is in the act of mating or sexual intercourse. In animals this is, so far as we know, merely physical satisfaction. In human beings it is, in addition to that, an emotional and spiritual satisfaction because, in this act, two people come closer to each other than in any other way and express their love for each other. Also, animals have very little control over the act. Human beings can decide for themselves when to perform it.

With human beings, this act should take place between a man and a woman when they are married, and when they want children who can live with them. As it says in the Book of Common Prayer, one of the reasons why men and women get married is 'for the increase of mankind according to the will of God, and that children

might be brought up in the fear and nurture of the Lord, and to the praise of His holy name'. (This does not mean that a child will always be born if an act of mating takes place between a man and a woman; this will happen only if an egg has been fertilized, and an egg is not always there to be fertilized.)

Another reason for marriage which the Prayer Book gives is 'the mutual society, help and comfort which the one ought to have of the other'. This really means love and friendship, and the sharing of joys and sorrows.

For these two reasons, therefore, a man and a woman should only get married when they know that they love each other. They will want each other so much that they are prepared to live together throughout the whole of their lives. They know, too, that if children are born, they must look after them for many years, until they are old enough to go out into the world on their own, and they in their turn can become parents.

Animals do not have thoughts like these. Some animals do not look after their young at all, and no animals care for their young for more than a year after birth. This is an important difference between animals and human beings.

Whilst we don't want to make the first chapter of the Bible into a scientific text-book, we are certain that very great truths are expressed in it. One of them is: 'And God said, Let us make man in our own image, after our likeness.' That is, human beings have, in their make-up, something of God. And when, in the New Testament, we look at the word picture of Jesus Christ, we can say: 'That is the sort of human being that God would have

us be.' We shall never understand human beings if we think of them as a species of rather superior animal. Our job in life is to try to act like human beings and not like animals.

To care for their children, human beings set up a home for themselves and their children. It is true, of course, that some animals make something like a home for their young, as, for example, the nests of birds, or the warren of rabbits. But many animals are wanderers with no settled abode. There is nothing to compare with the good home that some human beings make, where not only bodily growth can take place, but also growth of character.

A second important difference between animals and human beings lies in the fact that while practically every animal mates, quite a large number of human beings do not. They may remain unmarried for several reasons. Sometimes they never meet anyone they love deeply enough. Sometimes the person they love is killed, or marries someone else. Sometimes their own work seems so important to them that, for the sake of it, they give up all idea of marrying. At the end of this book you will read something about how each of us has to help the whole human family. You will soon be able to think of a great many ways in which you, if you happen to remain unmarried when you grow up, can be busy and useful to others, and therefore happy in yourself. Married people are often kept so busy looking after their families that it is lucky there are some unmarried ones about who have more time to spend on other activities.

A third difference is that most animals die when they can no longer give birth to young. But human beings normally live to 'a ripe old age'. Earlier in this book (on page 47) we said that the body of a woman stops setting free ripe eggs at about the age of forty-five or fifty. So, too, a man's body stops making sperms, only very much more gradually. After this they cannot have any more children, but they look forward to spending their old age together, and perhaps to having grandchildren.

During the time that a woman's body is ceasing to set free ripe eggs, often called 'the change of life' or 'the change', she may (though she doesn't always) become nervous and irritable, because of the changes which are taking place in her body. This, of course, may not happen, and in any case it is only temporary, but boys and girls should know about it, so that if it does happen to their own mother, they can help by being kind and gentle at this period. A man, also, may go through difficult stages as his body gradually stops making sperms.

Lastly, or perhaps this might have come first, a very important difference between animals and human beings is that, as far as we can tell, human beings are the only ones who know that God has made them and everything else in the world in which we live.

The important point in life is to remember that you are a human being, and that your task is to become as good a human being as you can. Remember that you are one of God's creatures, and try always to act as you think God intended you to act.

Chapter Fourteen

CHILD OF GOD

So far in this book we have thought about things which have life. We do not know what life is; all that we can do is to examine how living things grow, how they behave and so on. Only God knows what life is, for He created life 'in the beginning'. We believe that God intended human beings to be the greatest of His creations because like Him they possess, though in a much less degree, the power of creating things. It is true that animals can make certain things; for example, a bird can make a fine nest. But no animal can make the wonderful things a human being can make.

We believe that as God has given us something like His own creative powers, He is very much interested in us and in what we do. This is what Jesus Christ meant when he said that a sparrow could not fall to the ground without God knowing, and He said, 'Ye are of more value than many sparrows'.

So, too, the Catechism in the Book of Common Prayer reminds us that in our baptism we were made 'the child of God'. Notice that we are not just made 'a child of God', one amongst many whom God does not

notice because of the crowd, but we are each important in His eyes; we are all '*the* child of God'.

We must therefore try to be worthy of our importance in the eyes of God. First of all, we have seen that God has given us a very wonderful body. Throughout the whole of life we must care for the body God has given us. As the Bible says, 'Your body is a temple of the Holy Spirit'. For this reason, for our own happiness and for that of others, it is our duty to keep it as healthy as we can.

To care for the body God has given us, we shall keep it clean. We shall take exercise regularly, to keep fit so that we can do worthwhile things in life; we shall take care that we have enough sleep by going to bed early. That is, we shall try to be temperate in all things.

Boys and girls, as we have seen, have different kinds of bodies, so that they can do different things. For example, a girl could not become a father, neither could a boy become a mother. Some things in life a girl cannot do and some things a boy cannot do. But both are necessary before a new human baby can be brought into the world.

It seems to be quite a natural thing for most girls to take care of their bodies so that when they are married later in life, they will be able to bring children into the world. Most girls at some time in life look forward to this; even when they are small they like to play with dolls and think of themselves as little mothers.

Boys don't think so much about becoming fathers as girls do about becoming mothers. But it is important to remember that later in life most boys will marry and

become fathers. Boys usually become stronger in body than do girls. It is good that this is so, because later in life they will need their bodily strength to work and provide for their families as good fathers should. So boys too will learn to care for their bodies, to keep them clean and healthy and strong. And the time to develop habits like this is when you are young.

Remember, then, that God made two sorts of beings; boys and girls, males and females. A boy is not more important than a girl; neither is a girl more important than a boy. A boy is *the* child of God; so is a girl. Both are necessary in the world, and both are equally important in the sight of God.

Chapter Fifteen

THE FAMILY OF GOD

How would you like to live on a desert island? You would soon begin to feel lonely. Robinson Crusoe was glad when he found a companion in Man Friday. Few of us like to be alone for very long. We are social beings; we like to be in the company of others.

Even animals like company. Some animals always live in large groups as, for example, flocks of sheep, herds of wild horses, packs of wolves. In the late summer you can see swallows gathering together before migrating to a warmer place. In winter, as you walk along a country lane, you may see parties of finches flitting in and out of the hedges. Human beings like being together more than animals; they like to be members of a family, of a church, or of a club.

Now because human beings live so much together, they are dependent on each other. If you tried to reckon how many people you had depended on to-day, you could soon make out a long list: your mother who cooked your breakfast, the baker who made the bread, the miller who ground the corn, the farmer who sowed

the seed, the lorry driver who brought the flour to your baker; so the list grows and grows. We are all dependent on each other.

So, although we are all *the* child of God, we are at the same time members of the family of God, and as we are all so dependent on other people, so other people are dependent on us. It is our duty, therefore, to keep ourselves fit and mentally alert so that we, in our turn, can help others as they are helping us.

Amongst whatever group or groups of people we live, we must think of it as our duty to do something useful. In the home, the centre of the most important of all groups of people, namely the family, there is much that boys and girls can do; in the school there is plenty of scope for helping; in the Church there are a thousand and one jobs waiting to be done; in the club there is no room for the slacker. Everybody, as the child of God, can be useful to someone else in the family of God.

As we all have value in the eyes of God, we should try to be worth what God wants us to be worth, and we should remember too that others are of equal worth. Less than a hundred years ago there was slavery in the world; the black races were considered as inferior and a white man could own a black man as his property. The white man could sell a black man, and often did, even if it meant that children would be left without father or mother. Those of you who have read *Uncle Tom's Cabin* will know the sort of conditions that could be found in the world less than a hundred years ago.

There was, too, about the same time, another type of slavery; this was not so bad as the slavery we read about in *Uncle Tom's Cabin*, but it was bad enough. Children had to work for long hours for little pay and in wretched conditions. Men were often paid too little for the work they did, and so were women. And what was worse, there was always the fear that there would not be enough work to enable them to earn enough money for even the bare necessities of life.

We must, then, learn to have great respect for the bodies which God has given us, and at the same time have respect for the bodies of other people.

We must learn, too, to have respect for the other wonderful things which have life, for animals, trees and flowers, for, in giving us these things, God has made our lives more interesting and beautiful. When we go for walks in the country, or in the park, we shall remember that all the beauties of nature have been given to us by God, and we shall not enjoy nature if we spoil trees and flowers.

We shall remember, too, that God made the whole world, not only that part of it which is living, but even the slates with which we roof our houses, the tar which is sprayed on the road, petrol for cars, sand for making glass, iron used in our steel-works, as well as the more precious things like silver and gold. All these things, and many more, are precious to us because God made them and gives us the use of them. We must respect these things, not in the same way that we respect living things, by being kind to them, but by taking care not

to waste them and by sharing them fairly with other people.

As we have tried to show in this book, God made us to be His children. He made us in a very wonderful way, and placed us in a wonderful world.

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